SIEMENS

SONOCUR

SP

Service Instructions

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Document revision level

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Safety information

General safety information

If it is necessary to perform service work while high voltage is present on the component, observe the general safety regulations.

For all other service work, disconnect the line voltage plug of the SONOCUR.

When replacing boards or assemblies, switch off the SONOCUR, and observe ESD guidelines.

After all work is completed and all covers have been reattached, perform the protective ground wire test according to ARTD-002.731.17.

The protective ground wire resistance may not exceed 0.2 Ohm.

When servicing the power-on assembly (replacing the power-on assembly or the power cable), the equivalent leakage current must be measured and documented.

Applicability and regulations for subsidiaries

Equivalent leakage current measurement

Where applicable, the equivalent leakage current measurement must be performed as described under DIN VDE 0751 Part 1.

Where DIN VDE 0751 does not apply, the subsidiaries should comply with the following regulations (refer also to ARTD - 002.731.17, Safety-technical rules for installation and maintenance).

The local national regulations apply primarily for the subsidiaries.

If there are no existing local regulations, the following provisions should be observed in the interest of safety for customers, patients, employees and other persons as well as the company.

Initial measured value

The equivalent leakage current measurement was performed at the factory and the value measured was entered in test protocol 1. The measurement was made at the line voltage and line frequency indicated in test protocol 1.

If the on-site line voltage or the line frequency differs from the information indicated upon delivery of the SONOCUR, the listed values are invalid. The values should be marked invalid (crossed out with the comment "invalid values", signed and dated).

The equivalent leakage current measurement must be repeated. The resulting value may not exceed 2 mA according to DIN VDE 0751 Part 1 (refer also ARTD - 002.731.17).

The initial measured value must be documented.

Repeat measurements

When performing maintenance or repair work on the primary power supply circuit (e.g. repairs to the power-on circuit), the equivalent leakage current test must be repeated.The values obtained in the subsequent tests may not exceed the threshold value of 2 mA as specified in VDE 0751, Part 1 (refer also to ARTD-002.731.17). In addition, they may not exceed the initial measured value by more than 50%. If the value exceeds this threshold, the SONOCUR system must be repaired. The measured value must be documented.

General information

- Information specific to SONOCUR only is included in these service instructions. When performing service work on ultrasound systems, please use the technical documentation for ultrasound systems.
- **For the SONOCUR Plus C:**
  Always eject the SONOCARD 60000 or SONOCARD 1500 before switching off the system.

Required tools and auxiliary devices

Tools

NOTE	**The specified articles are listed in the STC (Service Tools Catalog) if nothing else is indicated (the STC is a component of the Spare Parts Catalog).**

- Service tools
- Protective conductor meter — Part No. 44 15 899 RV 090
  or Bender safety tester — Part No. 97 06 979 Y0526
- DVM, Fluke 8060 — Part No. 97 02 101 Y4290

Auxiliary devices

- Loctite No. 221 — Part No. 20 48 874
- 4 l distilled water

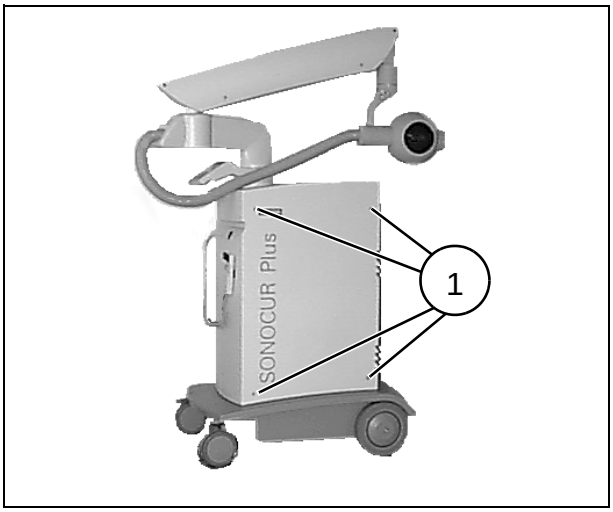


Fig. 1

System cover

- Remove the 4 Allen screws (1/Fig. 1) on each side, and remove both parts of the cover.

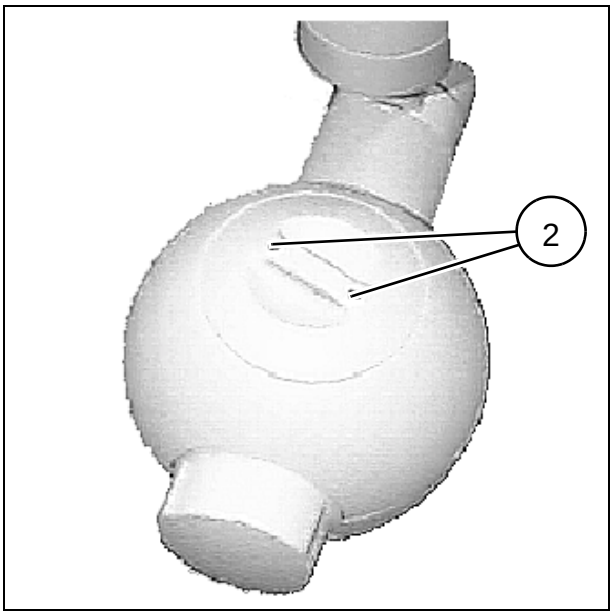


Fig. 2

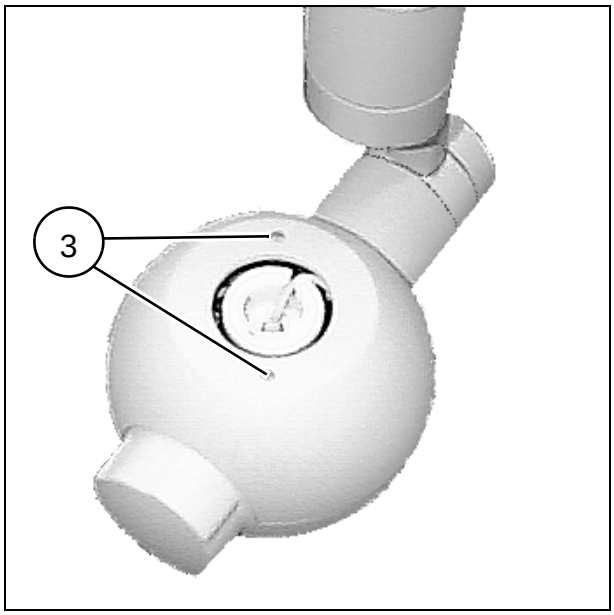


Fig. 3

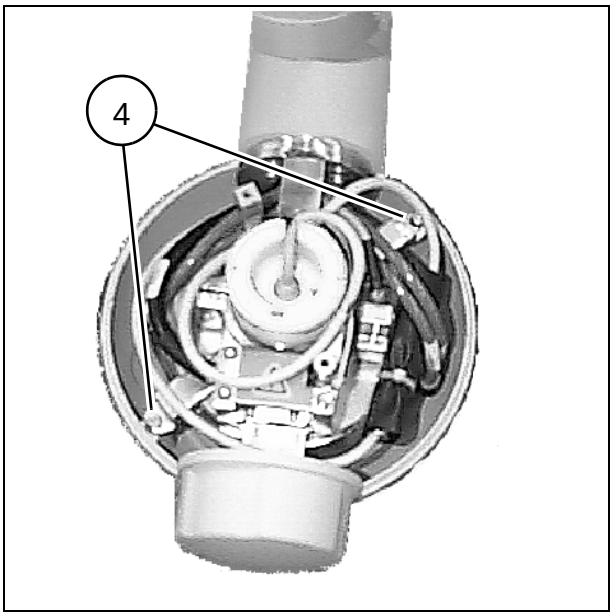
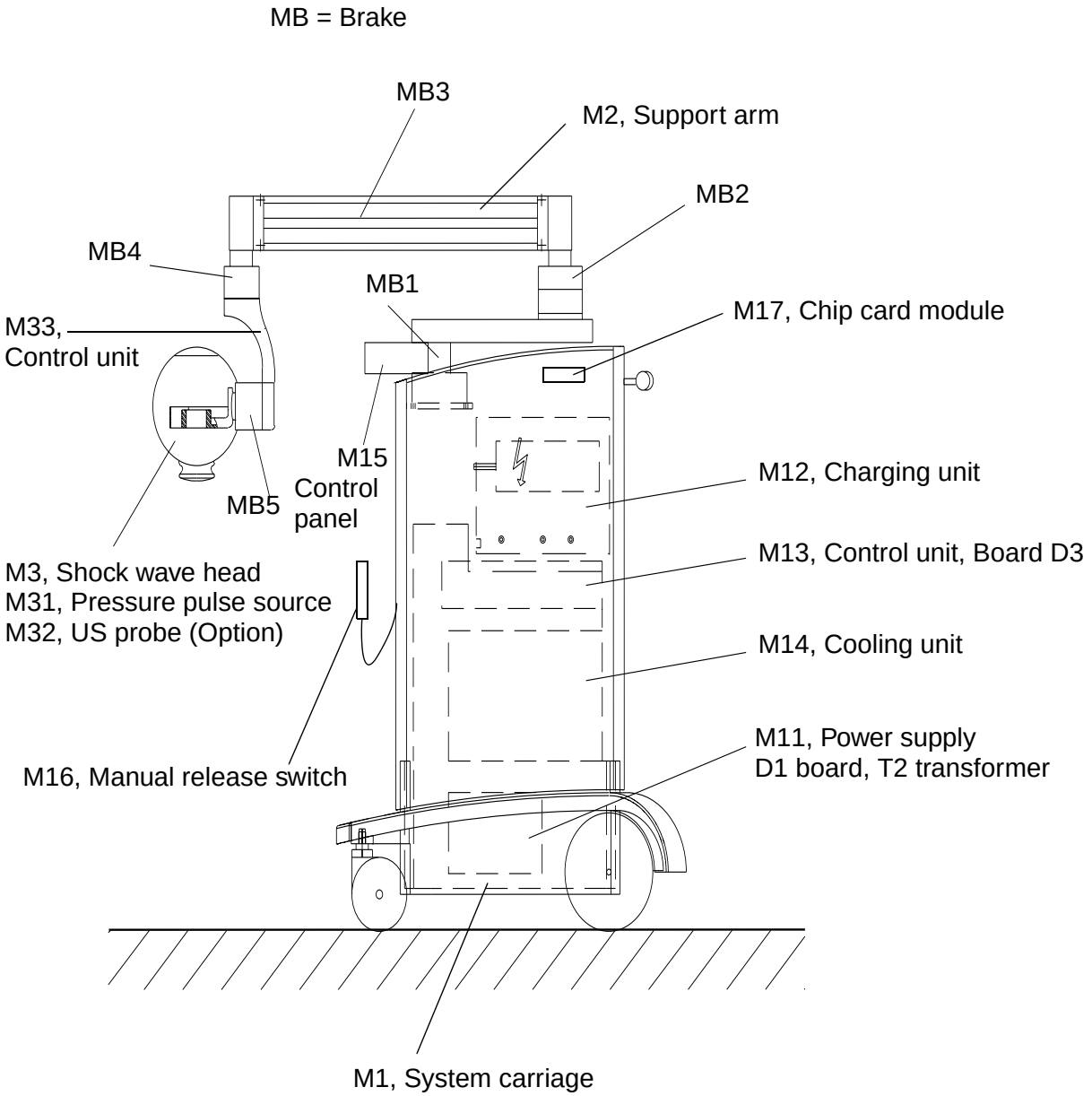


Fig. 4

Removing the sound wave head covers

- Remove the 2 Allen screws (2/Fig. 2) and take off the sector control handle.
- Remove the 2 Allen screws (3/Fig. 3) and take off the upper half of the sound wave head housing.
- Remove the 2 Allen screws (4/Fig. 4) and take off the lower half of the sound wave head housing.


MB = Brake
MB3
M2, Support arm
MB2
MB4
MB1
M17, Chip card module
M33,
Control unit
M15
Control
panel
MB5
M12, Charging unit
M3, Shock wave head
M31, Pressure pulse source
M32, US probe (Option)
M13, Control unit, Board D3
M14, Cooling unit
M11, Power supply
D1 board, T2 transformer
M16, Manual release switch
M1, System carriage

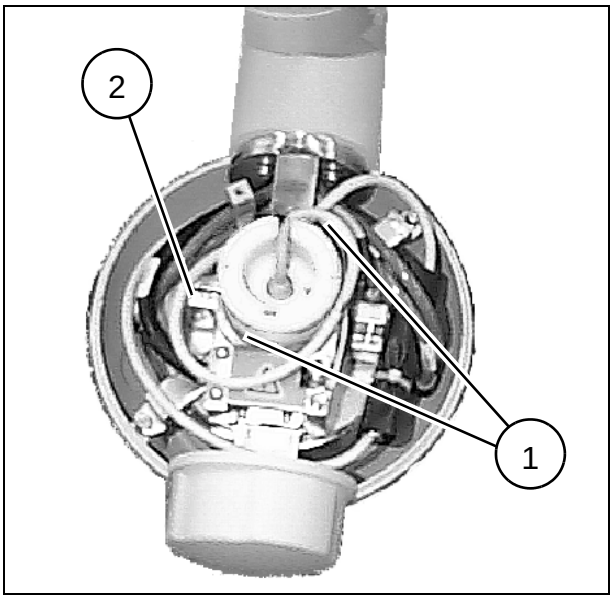


Fig. 1

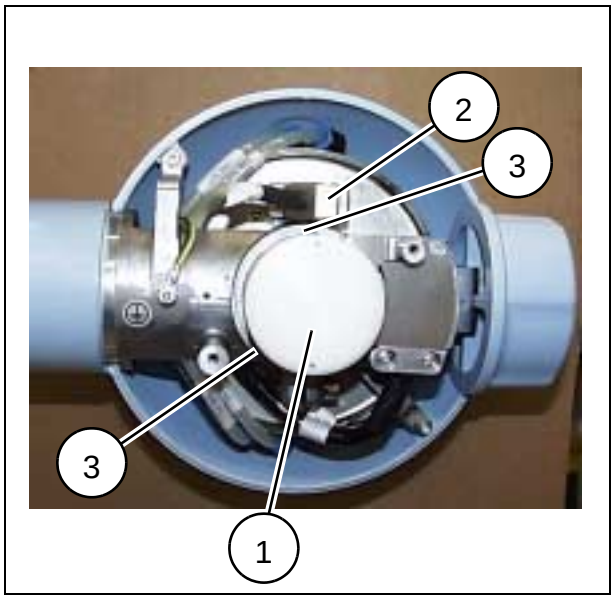


Fig. 2

US probe

Removal

- Move the sound wave head to the horizontal position (Fig.1).
- Switch the system off.
- Remove the sector control handle and the upper half of the sound wave head cover.
- Disconnect the plug for the temperature sensor.
- Remove both set screws (1/Fig. 1).
- Remove the strain relief for the US probe.
- Loosen the insulation on the Lemo connector.
- Disconnect the Lemo connector.
- Pull the US probe out toward the top.

Installation

- Insert the US probe (the stop studs must be pointing towards the knob).
- Reinsert both set screws, applying Loctite 221.

NOTE	**The US probe must rotate easily.**

- Reattach the strain relief for the US probe.
- Reconnect the Lemo plug.
- Reattach the insulation.
- Reconnect the plug for the temperature sensor.
- Reinstall the upper housing cover and reattach the sector control handle.

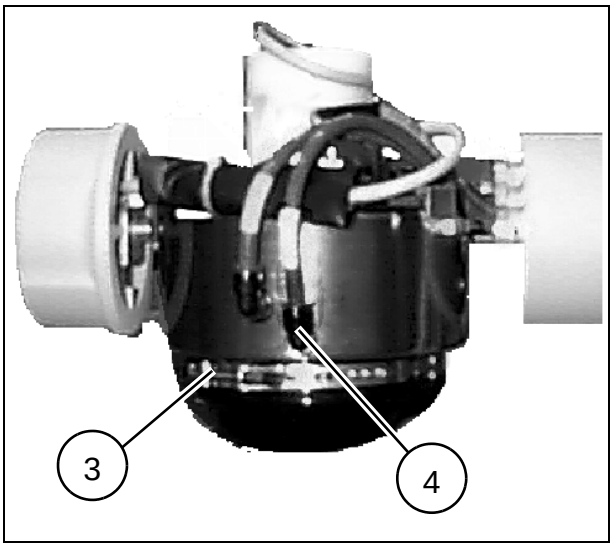


Fig. 3

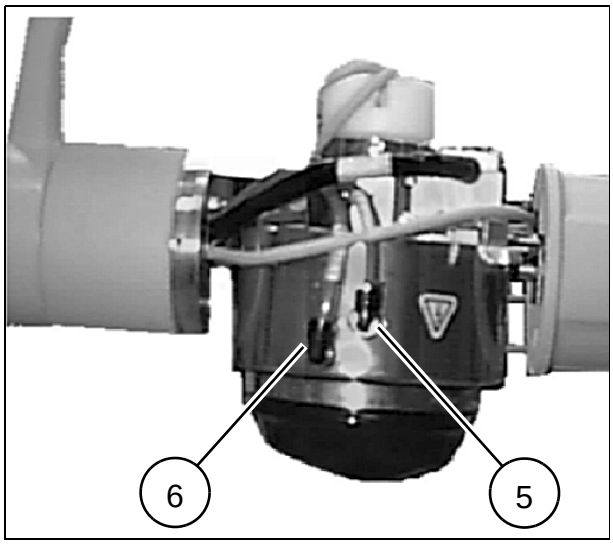


Fig. 4

- Switch the system ON.
- Reset the "US probe" counter.
- Fill the coupling circuit (refer to "Water system").
  Take note of the cooling system:
  - Round water tank (4-1),
  - Rectangular water tank (4-6).
- Carry out a function test.

White seal

Removal

- Unplug the connector for the temperature sensor (2/Fig. 2).
- Remove the two set screws (3/Fig. 2).
- Pull out the white seal.

Installation

- Insert the white seal.
- Turn in the two set screws with Loctite 221.
- Plug the connector for the temperature sensor back in.

Sound wave source (Sound wave module 301)

Removing the sound wave source

- Press the [—] key on the control console until the coupling bellows is located next to the lens.
- Switch the system OFF.
- Remove the covers from the sound wave head.
- SONOCUR with ultrasound
  - Remove the US probe (see US probe),
  - Remove the ball cage.
- SONOCUR without ultrasound
  - Remove the white seal (1/Fig. 2) (see the White seal).
- Remove the system cover.
- Remove the high voltage cover from the sound wave source.

⚠CAUTION	**The system must be switched off for at least 10 minutes before opening it.**

- Open valve Y8.

  ➪ This reduces the pressure in the cooling circuit.
- Disconnect all water hoses from the sound wave source.
- Remove the Allen screws (2/Fig. 1) from the sound wave source support.
- Pull the sound wave source out toward the bottom.

NOTE	**Make sure that the high voltage connections for the sound wave source are secure.**

Installing the sound wave source

- Insert the new sound wave source from the bottom and make sure that it is firmly seated.

NOTE	**Ensure that the guide groove and the high voltage connections do not become damaged.**

- Plug in the high voltage connections.
- Secure the sound wave source with the Allen screw (2/Fig. 1).
- Attach the high voltage cover.
- Reconnect all water hoses to the sound wave source.

- Cooling circuit return (5/Fig. 4)	"Blau/blue	Kuehl RKL"
- Coupling circuit return (4/Fig. 3)	"Gelb/Yellow	Ankl RKL"
- Cooling circuit intake (3/Fig. 3)	"Rot/Red	Kuehl VL"
- Coupling circuit intake (6/Fig. 4)	"Grün/Green	Ank. VL"

- SONOCUR with ultrasound
  - Install the ball cage,
  - Install the US probe (see US probe).
- SONOCUR without ultrasound
  - Remove the white seal (see the White seal).
- Reinstall the sound wave head cover.
- Fill the cooling circuit (refer to "Water system").
  Take note of the cooling system:
  - Round water tank (4-1),
  - Rectangular water tank (4-6).
- Fill the coupling circuit (refer to "Water system").
  Take note of the cooling system:
  - Round water tank (4-1),
  - Rectangular water tank (4-6).
- Reset the "shock wave head" counter.
- Reinstall the system cover.
- Perform a function test.

High voltage capacitor

Removal

- Switch the system off.
- Remove the system covers.
- Disconnect the power plug of the charging unit.
- Remove the locking screws from the charging unit.
- Pull the charging unit out toward the front.
- Remove the top cover of the charging unit.

⚠CAUTION	**The system must be switched off for at least 10 minutes before opening it.**

- Remove the front lateral filler plug.
- Remove the side cover from the high voltage cable.
- Remove the right and left locking screws from the capacitor connection.
- Remove the four visible cable ties from the capacitor mounting.
- Take the capacitor out toward the top.

Installation

- Thread in new cable ties.
- Insert the new capacitor from above.
- Reattach the left and right locking screws on the capacitor connection.
- Secure the capacitor with the cable ties.
- Reattach the top cover of the charging unit.
- Reinsert the lateral front filler plug.
- Reattach the side cover of the high voltage cable.
- Push the charging unit back in.
- Reinstall the locking screws in the charging unit.
- Reconnect the power plug of the charging unit.
- Reset the "capacitor" counter.
- Reinstall the system covers.
- Perform a function test.

Spark gap

Removal

- Switch the system off.
- Remove the system covers.
- Disconnect the power cable of the charging unit.
- Remove the locking screws from the charging unit.
- Pull the charging unit out toward the front.
- Remove the top cover of the charging unit.

⚠CAUTION	**The system must be switched off for at least 10 minutes before opening it.**

- Remove the filler plug in the back.
- Unclamp the cable from the center electrode (spark gap).
- Remove the external metal ring from the spark gap by loosening the 2 Allen screws.
- Remove the 2 Allen screws and disconnect the spark gap.

NOTICE	**Do not touch the ceramic body of the spark gap with bare hands. This may transfer impurities which can reduce operational life.**

Installation

- Insert the spark gap and secure it with the screws.
- Attach the metal ring.
- Reattach the center electrode.
- Reattach the top cover of the charging unit.
- Push the charging unit back in.
- Reinstall the locking screws in the charging unit.
- Insert the filler plug in the back.
- Reconnect the power cord for the charging unit.
- Reattach the system covers.
- Switch the system on.
- Reset the "spark gap" counter.
- Perform a function test.
- After replacing the spark gap, the following measures must be performed to assure correct function:
  - Couple the shock wave head to an object or retract the coupling bellows and retain it in this position with adhesive tape.
    (If there is no object only: to prevent damage, the coupling bellows should be located close to the lens).
- Select the highest energy level and release 500 ± 10 shock waves. If errors occur, reset it and release additonal shock waves.

Charging unit

- After replacement, reset the "capacitor and spark gap" counters.

Cooling unit

Check

- Pull off the two leads from the temperature switch B1 (the B1 is located on the cooling unit underneath the board D3 and the FOC connections).
- Connect the two pulled off leads.
- Switch the system on.
- The fan and the compressor in the cooling unit start - if not, check the power supply - if in order, replace the cooling unit.
- Switch the system off.
- Plug back the two leads.

Replace

- Fill the coupling/cooling circuit according to instructions.
- Fill out the field "Date of startup" on the cooling unit sticker.

Hose pump head

Removing the hose pump head

Hose pump head coupling circuit

- Remove the system cover.
- Remove the sound wave head cover.
- Open the coupling circuit return at the sound wave head.
- Press the [—] key on the control panel until air bubbles are visible in the water storage tank.
- Switch the system off.
- Remove the safety latch on the hose pump head.
- Press the lock downward and separate the hose pump head from the drive.
- Open the 2 hose clamps and remove the hoses.
- Remove the hose pump head.

Cooling circuit hose pump head

- Switch the system off.
- Open the system cover.
- Open valve Y8.
- Remove the locking latch on the hose pump head.
- Press the lock downward and separate the hose pump head from the drive.
- Open the 2 hose clamps and remove the hoses.
- Remove the hose pump head.

Installing the hose pump head

Coupling circuit or cooling circuit

- Install the hose pump head on the drive axle.
- Reconnect the 2 hoses with the hose clamps.
- Fill the corresponding water circuit (refer to "Water system").

IWAKI cooling pump

Removal

- Switch the system off.
- Open the system cover.
- Loosen the fast closures on the pump.
- Loosen the motor leads at the connection.
- Unscrew the pump.

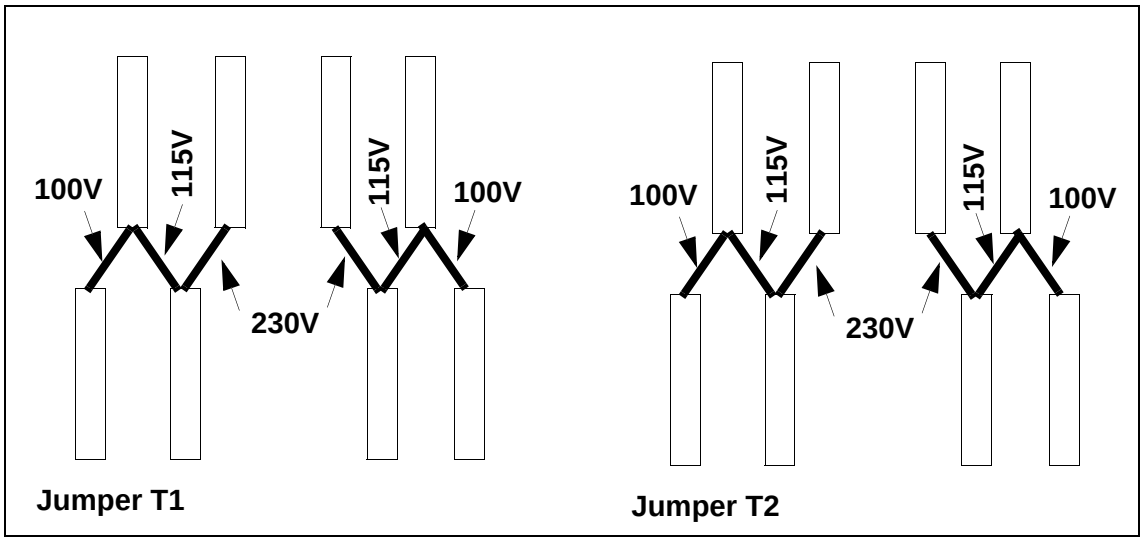
Installation

- Fasten the pump firmly.
- Connect the motor leads.
- Close the fast closures (pay attention to color marking).
- Fill the cooling circuit (see "Filling the cooling circuit" paragraph).

Power supply board D1

- Remove the D1 power supply board
- Check the jumpers on the new board.

Required jumpers for D1 board:



- Adapting the line voltage for the SONOLINE.

NOTE	**The line voltage that is set depends only on the SONOLINE system version being used.**

- Connect the SONOLINE as follows:

  - 230V X2.9 (neutral line) X2.7 L (Phase L1)
  - 115V X2.9 (neutral line) X2.8 L (Phase L1)

D3/M13 Complete (Item No. 56 48 139) or chip card reader

- Do not use the SONOCARD Gold for trouble-shooting on different systems. Repeated insertion of the SONOCARD Gold will render it unusable.
- Use a SONOCARD 1500 if you are performing service work, and suspect that the chip card reader, D3/M13, or SONOCARD Gold are defective.
- If the D3/M13 is replaced, the internal counter on the SONOCARD Gold counts up. If the Init counter in the "SERVICE INFO" menu exceeds 3, the SONOCARD Gold automatically becomes unusable.

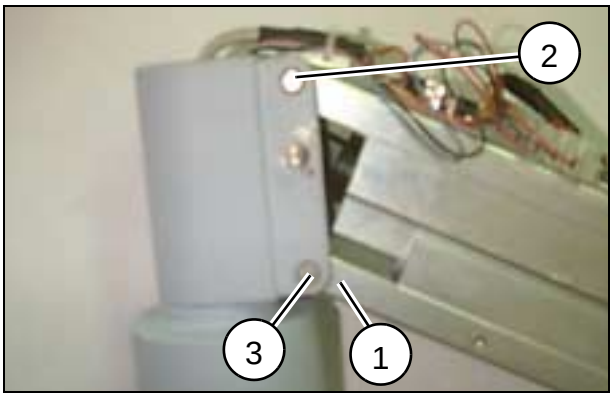


Fig. 5

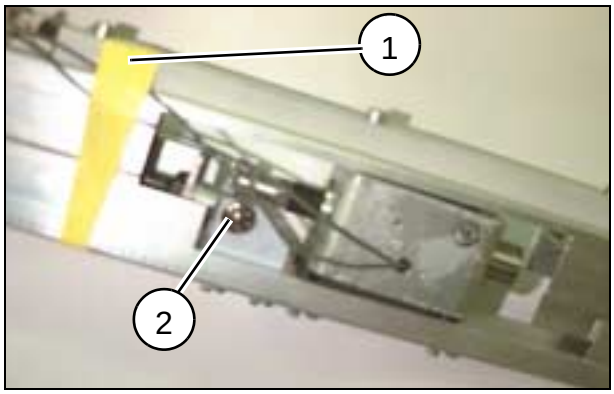


Fig. 6

Control handle

Removal

- Remove the support arm and system cover panels.
- Switch on the system.
- Drain the water from the coupling and cooling circuit (see water system).
  Take note of the cooling system:
  - Round water tank (4-1),
  - Rectangular water tank (4-6).
- Move the support arm into the bottom position and lock it in place (brakes engaged).
- Remove the set screw from the bottom guide stud (3/Fig. 5) of the control handle.
- Move the support arm into the top position and secure it in place (brakes engaged).
- Secure the two rails that run parallel on the support arm with insulation tape.
- Switch off the system.
- Remove the cover on the pressure pulse source.
- Remove the pressure pulse source (see "Removing the pressure pulse source").
- Remove the mounting for the pressure pulse source on the control handle.
- Turn the corrugated hose out of the corrugated hose holder and pull out the cables with the hoses.
- Unplug the electrical connection for the brake keys on the support arm.
- Remove the snap ring for the guide stud between the spring and the magnet (2/Fig. 6).
- Push out the connecting studs.
- Remove the set screw from the top guide stud of the control handle (2/Fig. 5).
- Push out the two guide studs and take the control handle off the support arm.

Installation

- Install the spring from the control handle that was removed in the new one.
- Install the new control handle on the support arm with the two guide studs.
- Center the guide studs and secure them in place with the set screws and Loctite 221.
- Insert the connecting studs between the spring and the magnet and secure them in place with the snap ring (2/Fig. 6).
- Reestablish the electrical connection for the brake keys on the support arm.
- Install the corrugated hose.
- Reinstall the mount for the pressure pulse source.
- Reinstall the pressure pulse source (see "Installing the pressure pulse source").
- Switch on the system.
- Fill the coupling circuit and cooling circuit.
  Take note of the cooling system:
  - Round water tank (4-1),
  - Rectangular water tank (4-6).

Checks

- Check the function of the brakes.
- Check triggering of the shock wave.

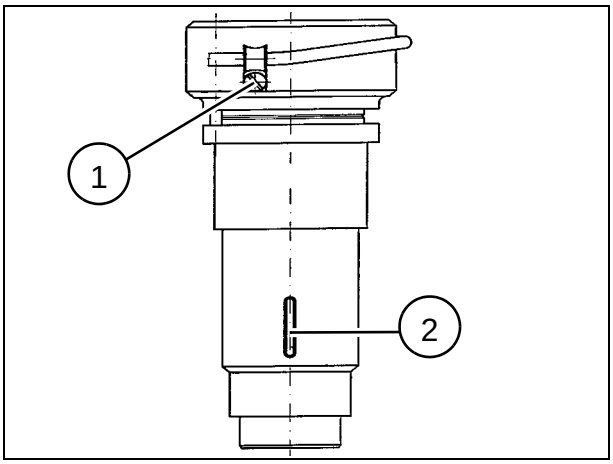


Fig. 7

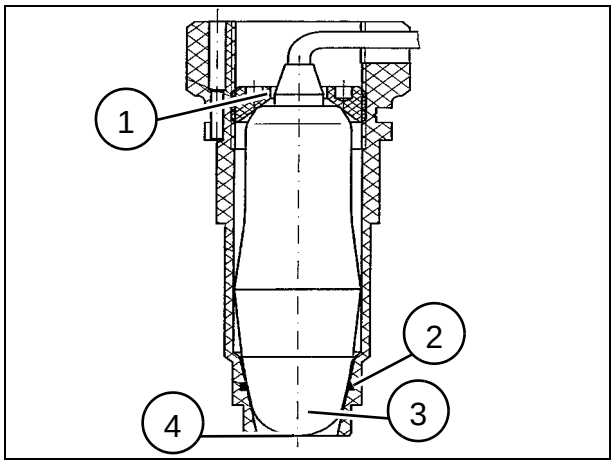


Fig. 8

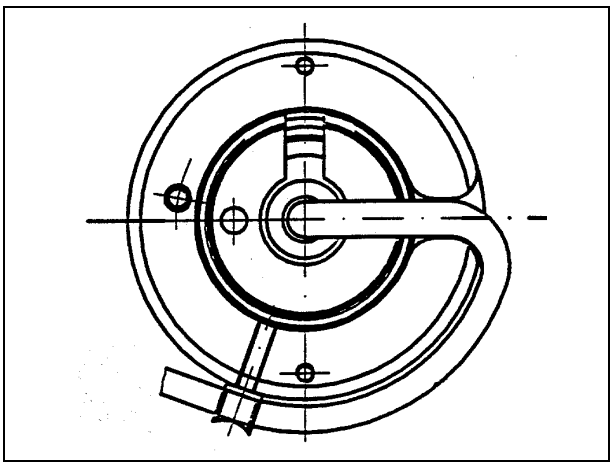


Fig. 9

Replacing the probe

Removal

- Remove the probe with the insert from the shock wave head (see "Removing the US probe").
- Remove the cable (1/Fig. 7) on the insert.
- Remove the mounting screw (1/Fig. 8).
- Press the probe out of the insert.

Installation

- Check to make sure the seal (2/Fig. 8) is correctly positioned.
- Lightly lubricate the probe head (e.g. Vaseline).
- Install the new probe.
- The mark on the probe must be visible in the position (2/Fig. 7).

- Tighten the mounting screw (1/Fig. 8). Make sure that the probe (3/Fig. 8) is flush with the edge (4/Fig. 8).
- Lay the cable as shown in Fig. 9 and secure it in place with the clamp.
- Install the probe in pressure pulse source (see "Installing the US probe").

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Fig. 1

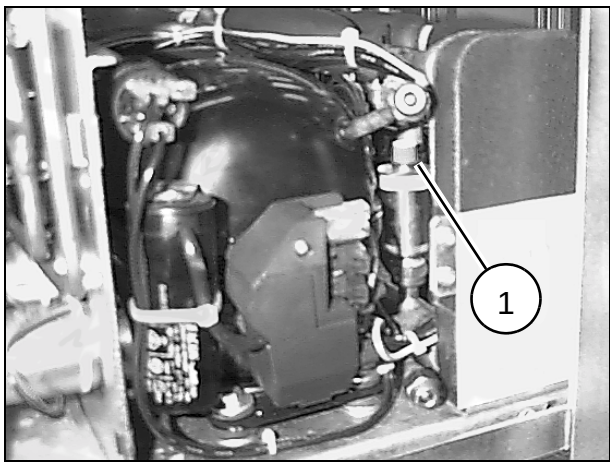


Fig. 2

One of two different cooling systems is used:

- Part No. 47 73 052 with the round water tank (Fig. 3)
  or
- Part No. 47 78 002 with the rectangular water tank (Fig. 5/6).

Water system (round water tank)

Filling the cooling circuit

- Fill the water storage tank halfway with water.
- Move the sound wave head into the filling position for the cooling circuit (Fig. 1).
- Open the vent valve in the cooling unit (1/Fig. 2).
- Set the two marks (arrow) on the three-way valve Y9 to position 1 and 2 (Fig. 3).
- Open two-way valve Y8 (4/Fig. 3).
  Y8 horizontal = closed / Y8 vertical = open
- If an IWAKI pump is present (5/Fig. 4)
  - check that the black marked hoses on the pump are connected.
- Switch the system on.
- Set the service switch in M13/D3/S2 to position 2 (Service on).
- Press the “Menu” key in the “MAIN MENU” on the control console (the next menu “STANDARD” is displayed).
- Press the "Next" key in the “STANDARD” menu once (the next menu “EXTRAS” is displayed).
- Press the "Next" key in the “EXTRAS” menu once (the next menu “SERVICEINFO” is displayed).
- Press the “Next” key (the next menu “TOOLS” is displayed).

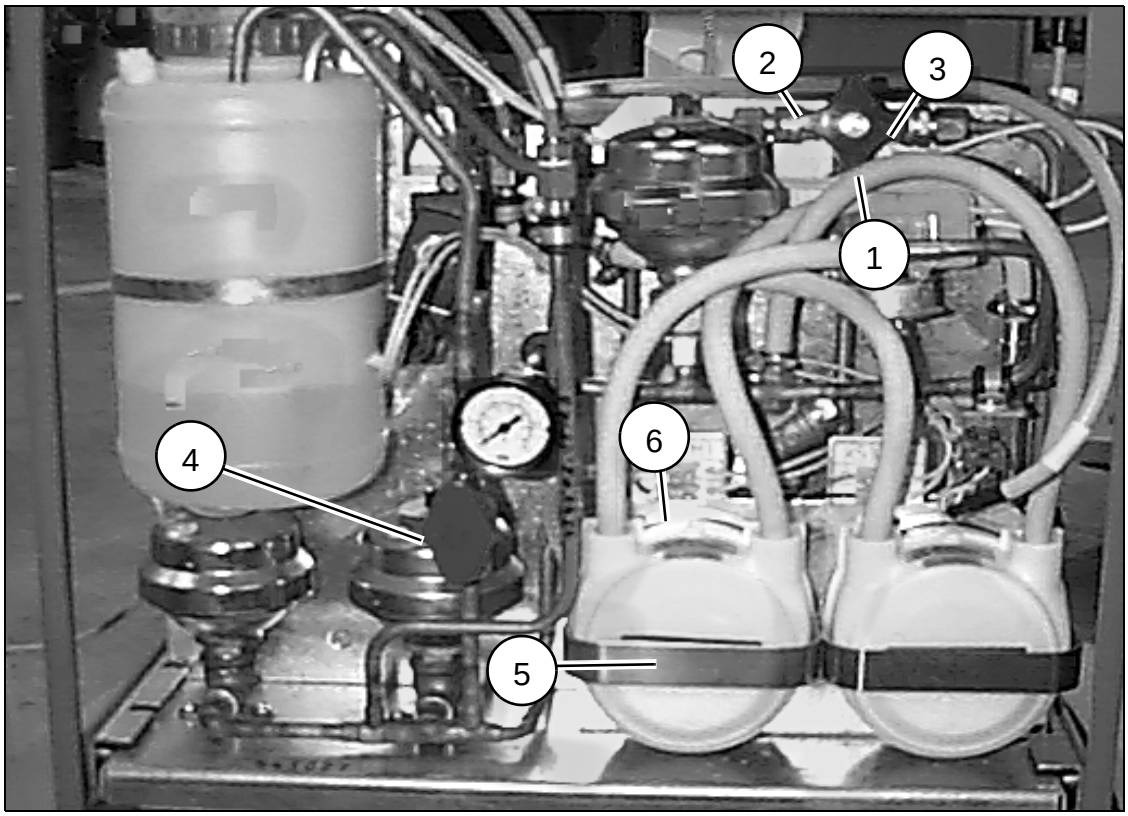


Fig. 3

- Select “Refill cooling unit”.

NOTE	**You can now control the cooling pump by pressing the [+] / [−] keys on the control panel.**

- Actuate the [+] key on the control panel until the water running from the return hose into the water storage tank is free of air bubbles.

NOTE	**As long as the [+] key is held down, hose pump M1 will run and the cooling circuit will fill.**

- Continue actuating the [+] key on the control panel for approximately 5 minutes after filling is completed, moving the sound wave head and the corrugated tubing until there are no more air bubbles in the cooling circuit.
- Close two-way valve Y8 (4/Fig. 3).
- If the hose pump is present (5/Fig. 3)
  - Actuate the [+] key until the pressure in the cooling circuit reaches 600 mbar (this can be checked on the manometer).
  - Set the two marks (arrow) on the three-way valve Y9 to position 1 and 3 (Fig. 3).

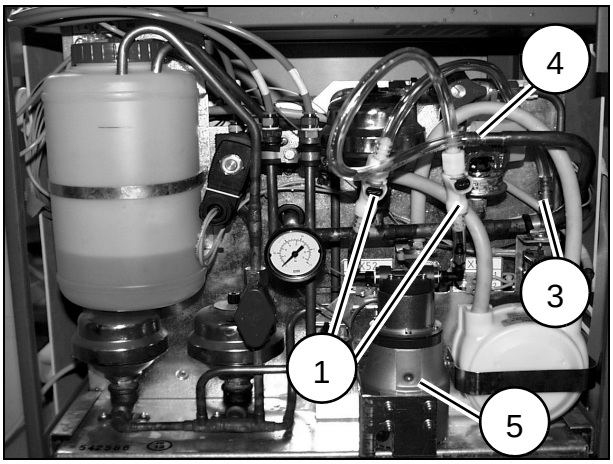


Fig. 4

- If an IWAKI pump is present (5/Fig. 4)
  - Actuate the [+] key. Once the pressure in the cooling circuit has reached 600 mbar (can be checked on the manometer), close the valve Y9 (i.e. set the two marks (arrow) to position 1 and 3 (Fig. 3)).
- Leave the system switched on for 15 minutes to make sure that no pressure loss occurs. If a pressure loss occurs, repeat the pressure setting and also check the hose connections.
- Actuate the [+] key on the control panel for approx. 2 minutes to enable any air bubbles present to escape.
- Close the vent valve on the cooling unit (1/Fig. 2).
- Set the service switch on M13/D3/S2 to position 1 (Service off).
- Switch the system off.

Filling the coupling circuit

- Fill the water storage tank halfway with water.
- Move the sound wave head into the vertical position until the water return connection has reached the uppermost position.
- Press the “Menu” key in the “MAIN MENU” on the control panel (the next menu “STANDARD” will be displayed).
- Press the "Next" key in the “STANDARD” menu once (the next menu “EXTRAS” is displayed).
- Start the water circulation cycle.

NOTE

While the water is circulating, move the sound wave head and the corrugated tubing until there are no more air bubbles in the coupling bellow. The water circulation cycle will end automatically after approximately 45 seconds.

- If air bubbles can still be seen in the coupling bellow, restart the water circulation cycle.

- Move the system just into the coupling range and fill the water storage tank up to 14 cm below the lower edge.

NOTE	**In the minimal coupling range, the bellow will be close to the lens.**

Emptying the cooling circuit

NOTE	**When opening the water system, avoid direct contact with the water.** **Thoroughly rinse any contact areas under clean, running water.**

- Remove the water storage tank.
- Attach a hose to the return tube.
- Place the end of the hose in a catch basin.
- Set the two marks (arrow) on the three-way valve Y9 to position 1 and 2 (Fig. 3).
- Open two-way valve Y8.
- Set the service switch at M13/D3/S2 to position 2 (Service on).
- If an IWAKI pump is present (5/Fig. 4)
  - change over the water connections on the pump, i. e. the black marked hoses may not be connected.
- Switch the system on.
- Press the “Menu” key in the “MAIN MENU” on the control panel (the next menu “STANDARD” is displayed).
- Press the “Next” key in the “STANDARD” menu once (the next menu “EXTRAS” is displayed).
- Press the “Next” key in the “EXTRAS” menu once (the next menu “SERVICEINFO” is displayed).
- Press the “Next” key (the next menu “TOOLS” is displayed).
- Select “Refill cooling unit”.

NOTE	**You can now control the cooling pump by pressing the [+] / [−] keys on the control panel.**

- Actuate the [−] key on the control panel until there is no more water in the cooling circuit.
- Set the two marks (arrow) on the three-way valve Y9 to positon 1 and 3 (Fig. 3).
- Close two-way valve Y8.
- If an IWAKI pump is present (5/Fig. 4)
  - connect the black marked hoses again.
- Set the service switch on M13/D3/S2 to position 1 (Service off).

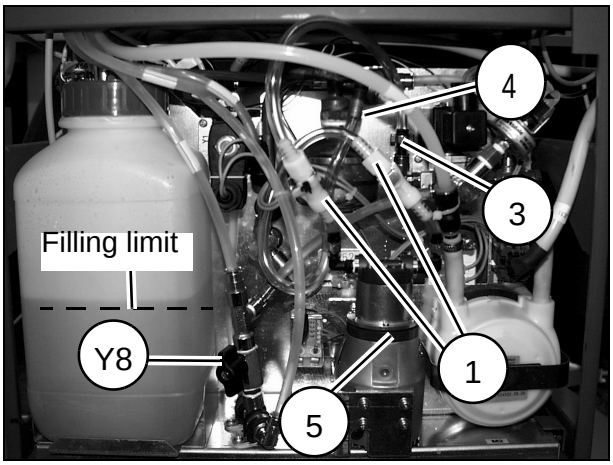


Fig. 5

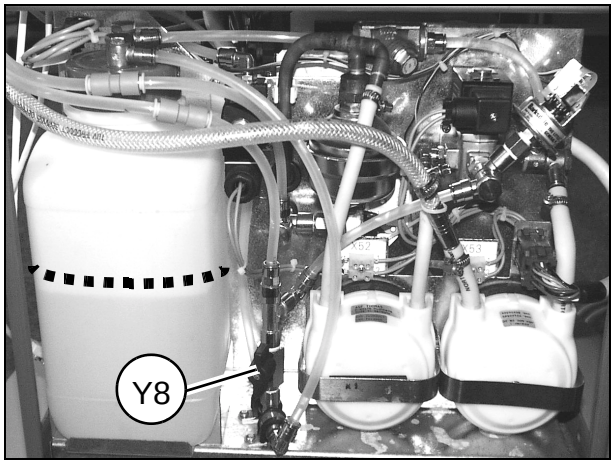


Fig. 6

Fig. 7

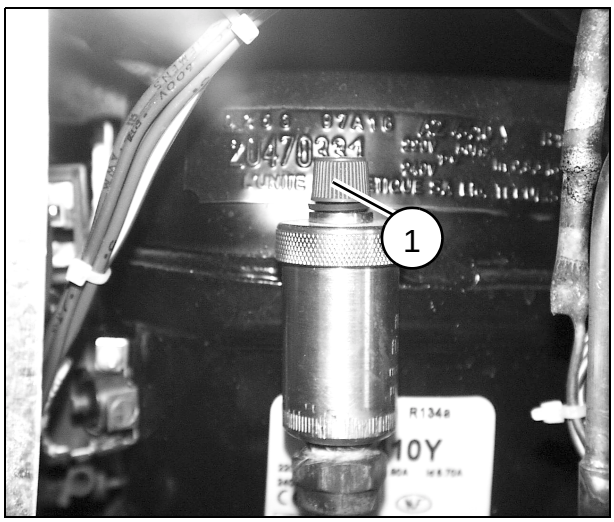


Fig. 8

Emptying the coupling circuit

NOTE	**When opening the water system, avoid direct contact with the water.** **Thoroughly rinse any contact areas under clean, running water.**

- Press the [—] key on the control panel until the bellow is next to the sound wave source.
- Switch the system off.

Water system (rectangular water tank)

Filling the cooling circuit

- Fill the water storage tank halfway with water.
- If an IWAKI pump is present (5/Fig. 5)
  - check that the black marked hoses on the pump are connected.
- Switch the system on.
- Move the sound wave head into the filling position for the cooling circuit (Fig. 7).
- Open the pressure relief valve (cap) in the cooling device; back it up by two full turns (1/Fig. 8).
- Open the 2/3-way valve Y8 (Fig. 5/6),
  i.e., adjust the Y8 lever from horizontal = locked to vertical = open.
- Set the service switch on M13/D3/S2 to position 2 (Service on).
- Press the "Menu" key in the "MAIN MENU" on the control panel (the next menu "STANDARD" is selected).
- Press the "Next" key in the "STANDARD" menu once (the next menu "EXTRAS" is selected).
- Press the "Next key in the "EXTRAS" menu once (the next menu "SERVICEINFO" is selected).
- Press the "Next" key (the next menu "TOOLS" is selected).
- Switch "Refill cooling unit“ to "ON".

NOTE	**You can now control the cooling pump M1 by pressing the [+] / [−] keys on the control panel.**

- Actuate the [+] key on the control panel until the water running from the return hose into the water storage tank is free of air bubbles.

NOTE	**As long as the [+] key is held down, hose pump M1 will run and the cooling circuit will fill.**

- Close the 2/3-way valve Y8.
- Set the service switch on M13/D3/S2 to position1 (Service off).

NOTE	**Pressure automatically builds up in the cooling circuit.**

- Switch the system off.

Filling the coupling circuit

- Fill the water storage tank half full with water.
- Switch the system on.
- Move the sound wave head into the filling position for the coupling circuit.
  (This position is marked on the support arm with two arrows).

- Press the "Menu" key in "MAIN MENU" on the control panel (next menu "STANDARD" is selected).
- Press the "Next" key in the "STANDARD" menu once (next menu "EXTRAS" is selected).
- Select the water circulation cycle and start.

NOTE	**While the water is circulating, move the sound wave head and the corrugated tubing until there are no more air bubbles in the coupling bellow. The water circulation cycle will end automatically.**

- If air bubbles can still be seen in the coupling bellow, restart the water circulation cycle.
- Move the system into the minimal coupling range.

NOTE	**In the minimal coupling range, the bellow will be close to the lens.**

- Switch the system off.
- Fill the water reserve tank halfway with water.

Emptying the cooling circuit

NOTE	**When opening the water system, avoid direct contact with the water.**

- Thoroughly rinse any contact areas under clean, running water.
- Remove the water storage tank.
- Attach a hose to the return tube.
- Place the end of the hose in a catch basin.
- Move the sound wave head into the filling position for the cooling circuit (Fig. 4).
- Open the 2/3-way valve Y8 (Fig. 5/6),
  i.e., adjust the Y8 lever from horizontal = locked to vertical = open.
- Set the service switch on M13/D3/S2 to position 2 (Service on).
- If an IWAKI pump is present (5/Fig. 5)
  - change over the water connections on the pump, i. e. the black marked hoses may not be connected.
- Switch the system on.
- Press the "Menu" key in the "MAIN MENU" on the control panel (the next menu "STANDARD" is selected).
- Press the "Next" key in the "STANDARD" menu once (the next menu "EXTRAS" is selected).
- Press the "Next" key in the "EXTRAS" menu once (the next menu "SERVICEINFO" is selected).
- Press the "Next" key (the next menu "TOOLS" is displayed).
- Switch "Refill cooling unit“ to "ON".

NOTE	**You can now control the cooling pump M1 by pressing the [+] key on the control panel.**

- Actuate the [+] key on the control panel until the water is completely removed.

NOTE	**As long as the [+] key is held down, hose pump M1 will run and the cooling circuit will empty.**

- Set the service switch on M13/D3/S2 to position 1(Service off).
- Switch the system off.
- If an IWAKI pump is present (5/Fig. 5)
  - connected the black marked hoses again.

Emptying the coupling circuit.

NOTE	**When opening the water system, avoid direct contact with the water.**

- Thoroughly rinse any contact areas under clean, running water.
- Press the [−] key on the control panel until the bellow is next to the sound wave source.
- Switch the system off.

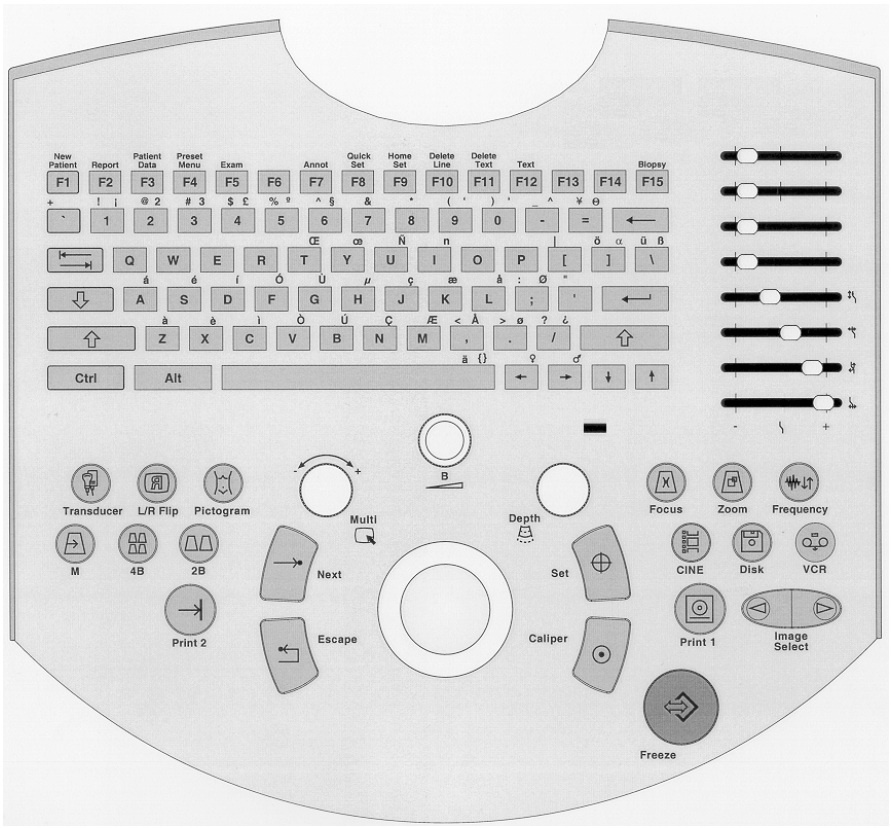


Fig. 1

Control panel overview SONOLINE Adara

ESWT mode

- Press the "F4" key.
- Press the "5" key.
- Select SONOCUR with the track ball.
- Press the ⊕ key.
- Enter the password.
- Use the track ball to select the ESWT mode.
- Press the ⊕ key.
- Use the track ball to activate the ESWT mode.
- Press the ⊕ key.
- Press the ↩ key twice.

Checking the sound wave focus

Preliminary steps

- Select the crosshairs on SONOLINE .

NOTE	**If the crosshairs cannot be selected on the SONOLINE, ESWT mode is probably not activated.**

- Attach the sound wave focus phantom with gel to the sound wave head.
- Execute the following basic settings on the SONOLINE:

Value	Set with:	German	English	French	Spanish
0 dB	Set trackball to SI (white background), then actuate and set value with control	SI	Output	Sortie	Salida
22 dB	Knob B	EV	Gain	Gain	Ampl
9s = 50 Hz 11d = 60 Hz	Set trackball to FPS (FPS has a white background and then press	B/S	FPS	IPS	CPS
130	Knob	------	------	------	------
60 dB	Set trackball to DR (white background), then actuate and set value with control	DR	Dyn Rng	DR	Cam Din

- Set the slide control according to Fig. 1.
- Select the ultrasound probe in the sound wave head.

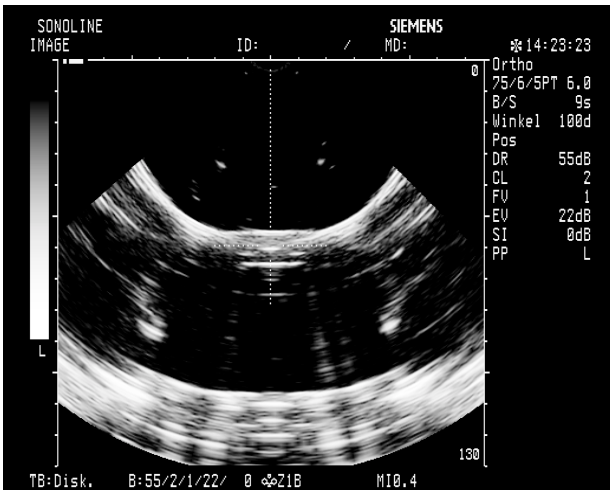


Fig. 2

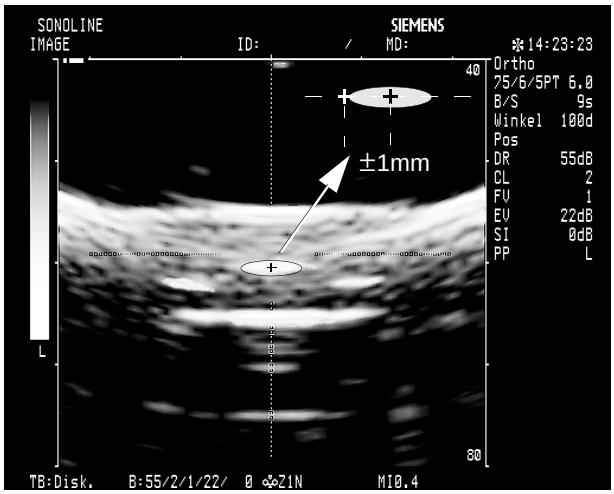


Fig. 3

Focus phantom display

Vertical control of the sound wave focus

- Select the crosshairs, unless already selected ⊕ .
- Press the ⊙ key.
- Move with the trackball to the center of the displayed sound wave focus. A value of 56 ± 2 mm must apprear in the display (Fig. 2).
- Press the ↩ key once.

Vertical adjustment of the sound wave focus

- Press the "F4" key.
- Press the "5" key.
- Select "SONOCUR" with the trackball.
- Press the ⊕ key.
- Enter the password.
- Select with the trackball..

- **German**:	Ziel	- **French**:	Cible
- **English:**	Target	- **Spanish:**	Objetivo

- The value of "56 mm" determined by the design must always be set.
- Press the ⊕ key.
- Press the ↩ key twice.

Horizontal adjustment of the sound wave focus

As of SONOLINE software version 2.3.0

- Select the crosshairs, unless already selected .
- Press the and then the key.
- Press the key.
- Move with the trackball on the vetical axis up to the center of the displayed sound wave focus,
- Press the key.
- Move the cross "+2" with the trackball horizontally up to the displayed sound wave focus.
- The maximum acceptable deviation is ± 1 mm from the vertical axis (Fig. 3).
- If the deviation exceeds the acceptable range, record the value for D2.

NOTE	**If the sound wave focus is shifted to the left of the vertical axis, the correction value must be given a negative algebraic sign (to the right is a positive sign).**

- Press the key once.

Horizontal setting of the sound wave focus

- Press the "F4" key.
- Press the "5" key.
- Select "SONOCUR" with the trackball.
- Press the key.
- Enter the password.
- Select with the trackball.

- German:	Bildkippung	**- French:**	Bascular
- English:	Image Tilt	**- Spanish:**	Inclinar imagen

- Press the key.
- Enter the half value of D2 with sign.
  Example: D2 = 3.0 mm (shifted to the left), enter -15.
- Press the key.
- Press the key twice.
- Rotate the probe over the full travel range (+ 90° to -90°).

NOTE	**The acceptable deviation from the isocenter is ± 1 mm. If the deviation is larger, repeat the image tilt setting.**

- Remove the sound wave focus phantom.

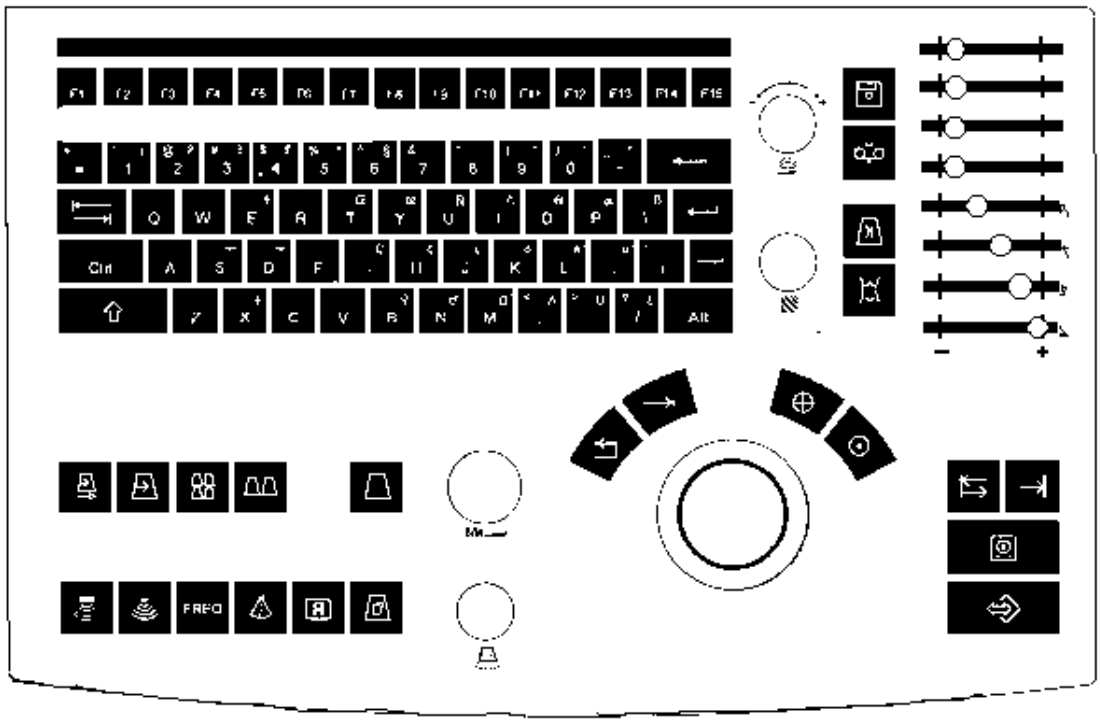


Fig. 4

Control panel overview SONOLINE Prima

ESWT mode

- Press the "F4" key.
- Press the "5" key.
- Select the SONOCUR with the trackball.
- Press the ⊕ key.
- Enter the password.
- Select the ESWT mode with the trackball.
- Press the ⊕ key.
- Activate the ESWT mode with the trackball.
- Press the ⊕ key.
- Press the ↩ key twice.

Checking the sound wave focus

Preliminary steps

- Select the crosshairs on SONOLINE ⊕ .

NOTE	**If the crosshairs cannot be selected on the SONOLINE, ESWT mode is probably not activated.**

- Attach the sound wave focus phantom with gel to the sound wave head.
- Execute the following basic settings on the SONOLINE:

Value	Set with:	German	English	French	Spanish
0 dB		SI	Output	Sortie	Salida
22 dB	B/M	EV	Gain	Gain	Ampl
9s = 50 Hz 11d = 60 Hz	Set trackball to FPS (FPS has a white background and then ⊕ press.	B/S	FPS	IPS	CPS
130		------	------	------	------
60 dB		DR	Dyn Rng	DR	Cam Din

- Set the slide control according to Fig. 4.
- Select the ultrasound probe in the sound wave head .

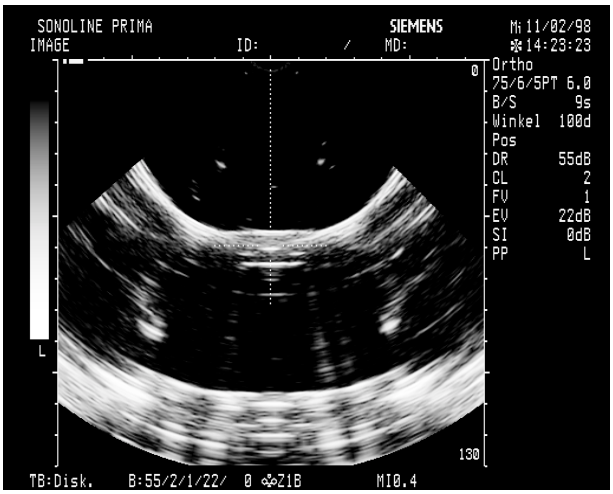


Fig. 5

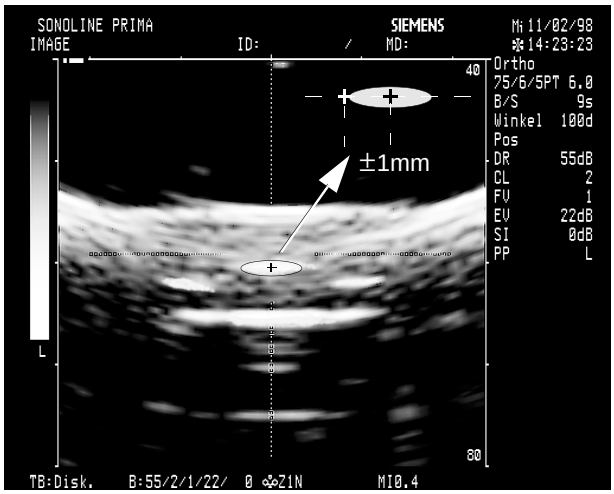


Fig. 6

Focus phantom display

Vertical control of the sound wave focus

- Select the crosshairs, unless already selected ⊕ .
- Press the ⊙ key.
- Move with the trackball to the center of the displayed sound wave focus. A value of 56 ± 2 mm must apprear in the display (Fig. 5).
- Press the ↰ key once.

Vertical adjustment of the sound wave focus

- Press the "F4" key.
- Press the "5" key.
- Select "SONOCUR" with the trackball.
- Press the ⊕ key.
- Enter the password.
- Select with the trackball..

- **German**:	Ziel	- **French**:	Cible
- **English:**	Target	- **Spanish:**	Objetivo

- The value of "56 mm" determined by the design must always be set.
- Press the ⊕ key.
- Press the ↰ key twice.

Horizontal adjustment of the sound wave focus

As of SONOLINE software version 2.3.0

- Select the crosshairs, unless already selected ⊕.
- Press the ⊙ and then the ⊕ key.
- Press the ⊙ key.
- Move with the trackball on the vetical axis up to the center of the displayed sound wave focus,
- Press the ⊕ key.
- Move the cross "+2" with the trackball horizontally up to the displayed sound wave focus.
- The maximum acceptable deviation is ± 1 mm from the vertical axis (Fig. 6).
- If the deviation exceeds the acceptable range, record the value for D2.

NOTE	**If the sound wave focus is shifted to the left of the vertical axis, the correction value must be given a negative algebraic sign (to the right is a positive sign).**

- Press the ↰ key once.

Horizontal setting of the sound wave focus

- Press the "F4" key.
- Press the "5" key.
- Select "SONOCUR" with the trackball.
- Press the ⊕ key.
- Enter the password.
- Select with the trackball.

- German:	Bildkippung	**- French:**	Bascular
- English:	Image Tilt	**- Spanish:**	Inclinar imagen

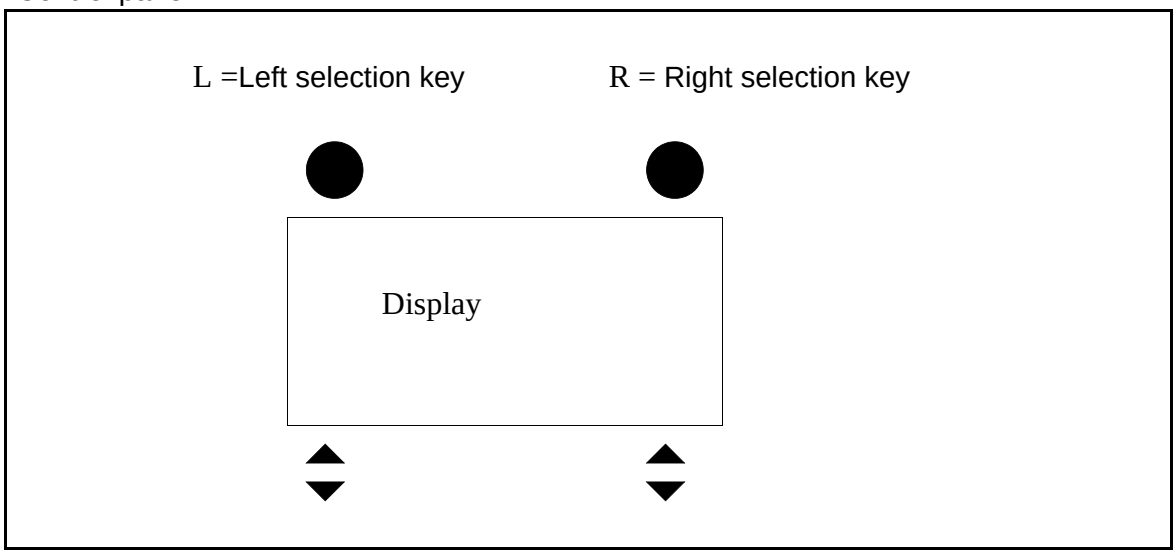
- Press the ⊕ key.
- Enter the half value of D2 with sign.
  Example: D2 = 3.0 mm (shifted to the left), enter -15.
- Press the ⊕ key.
- Press the ↰ key twice.
- Rotate the probe over the full travel range (+ 90° to -90°).

NOTE	**The acceptable deviation from the isocenter is ± 1 mm. If the deviation is larger, repeat the image tilt setting.**

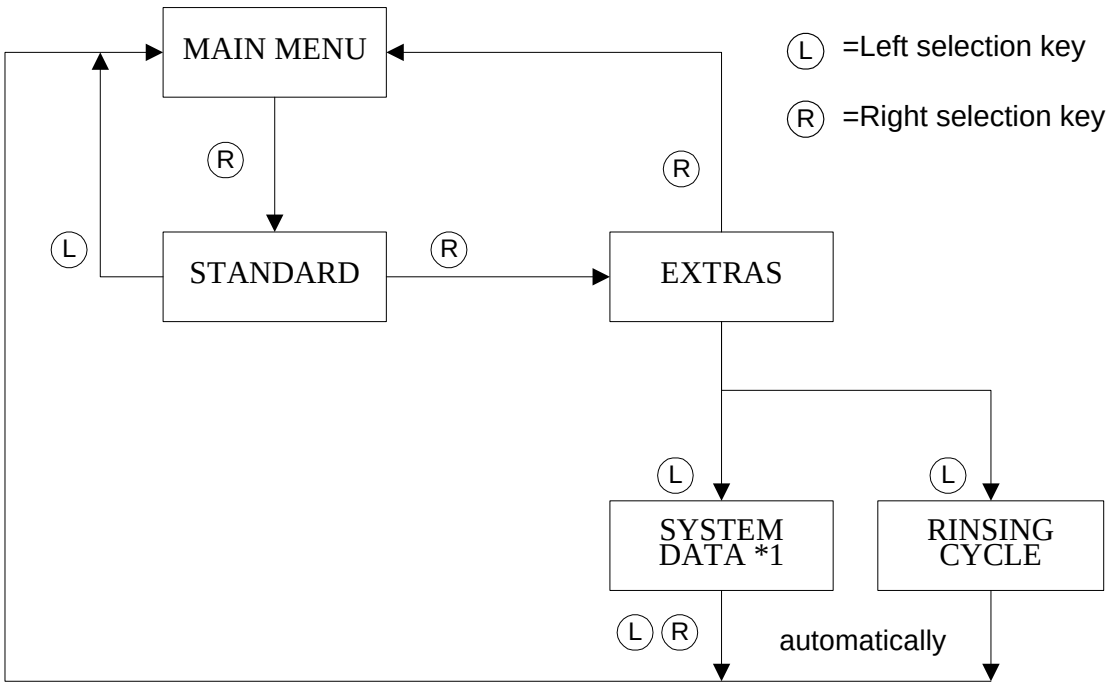
- Remove the sound wave focus phantom.

Cooling unit with a round water tank

Control panel



User

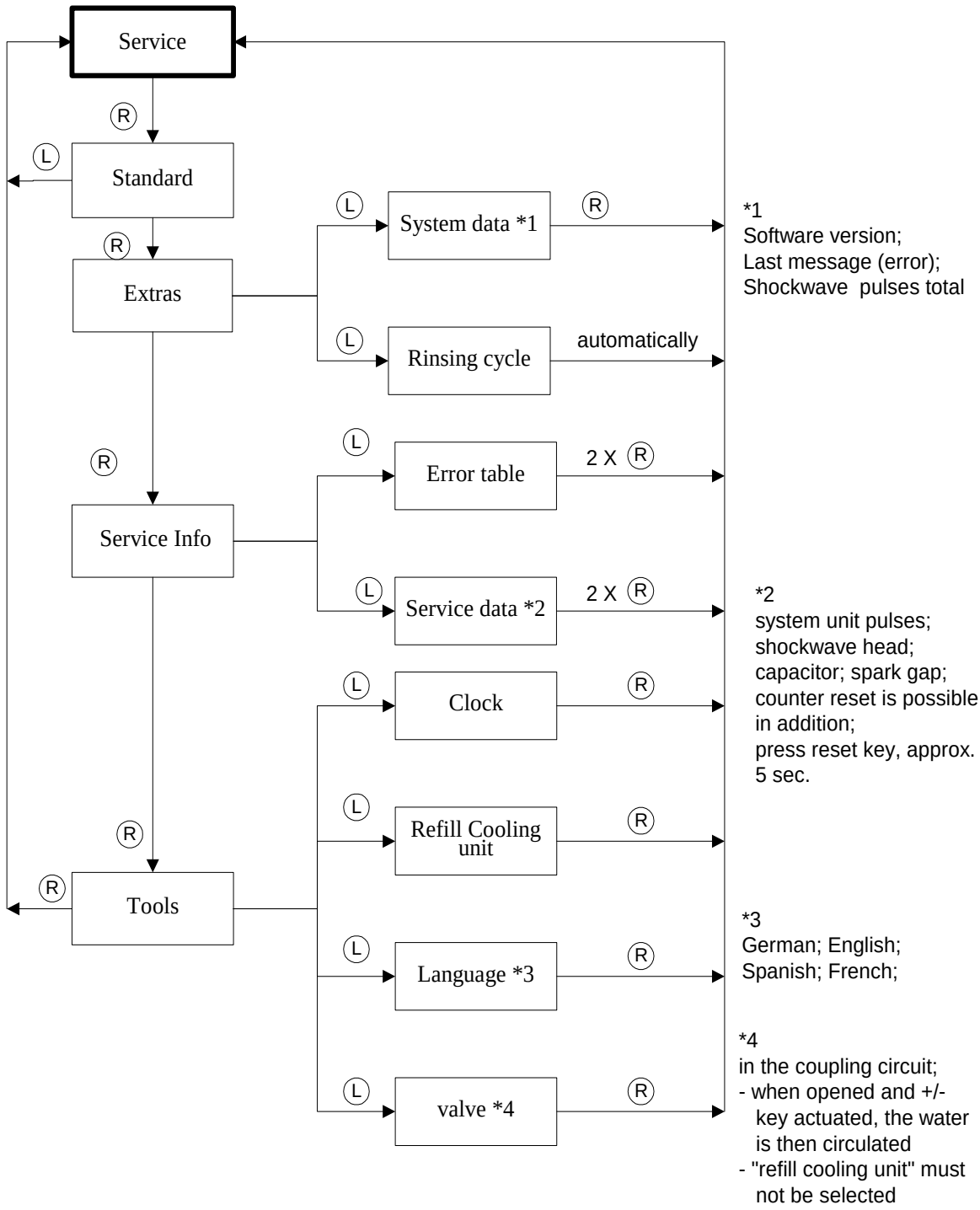


*1 Software version; Last message (error); Shockwave pulses total

Service

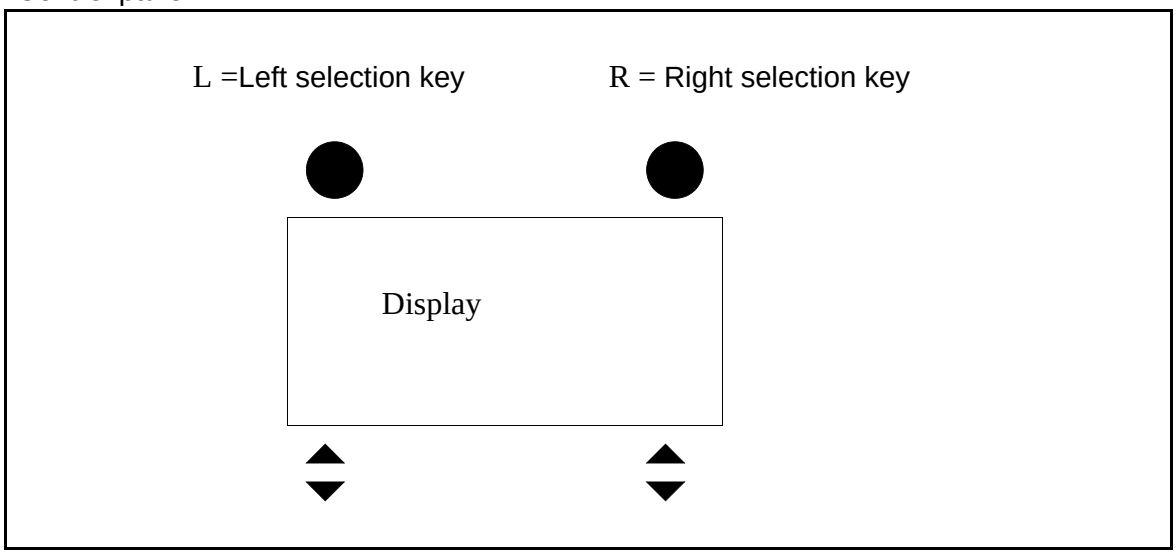
If the service switch on M13/D3/S2 is set to position 2 (Service on),

the following functions will be activated in addition to the normal user functions.
The “SERVICE” notice will be displayed in the main menu.

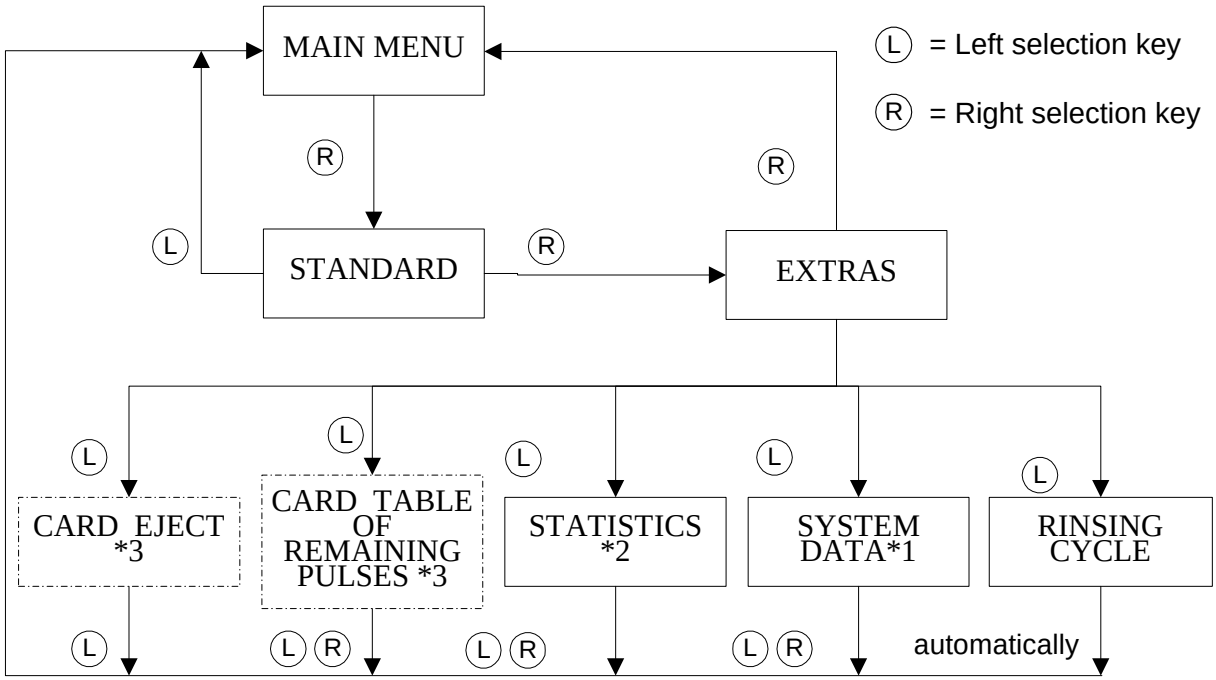


Cooling unit with a rectangular water tank

Control panel



User



*1 Software version; Last message (error)

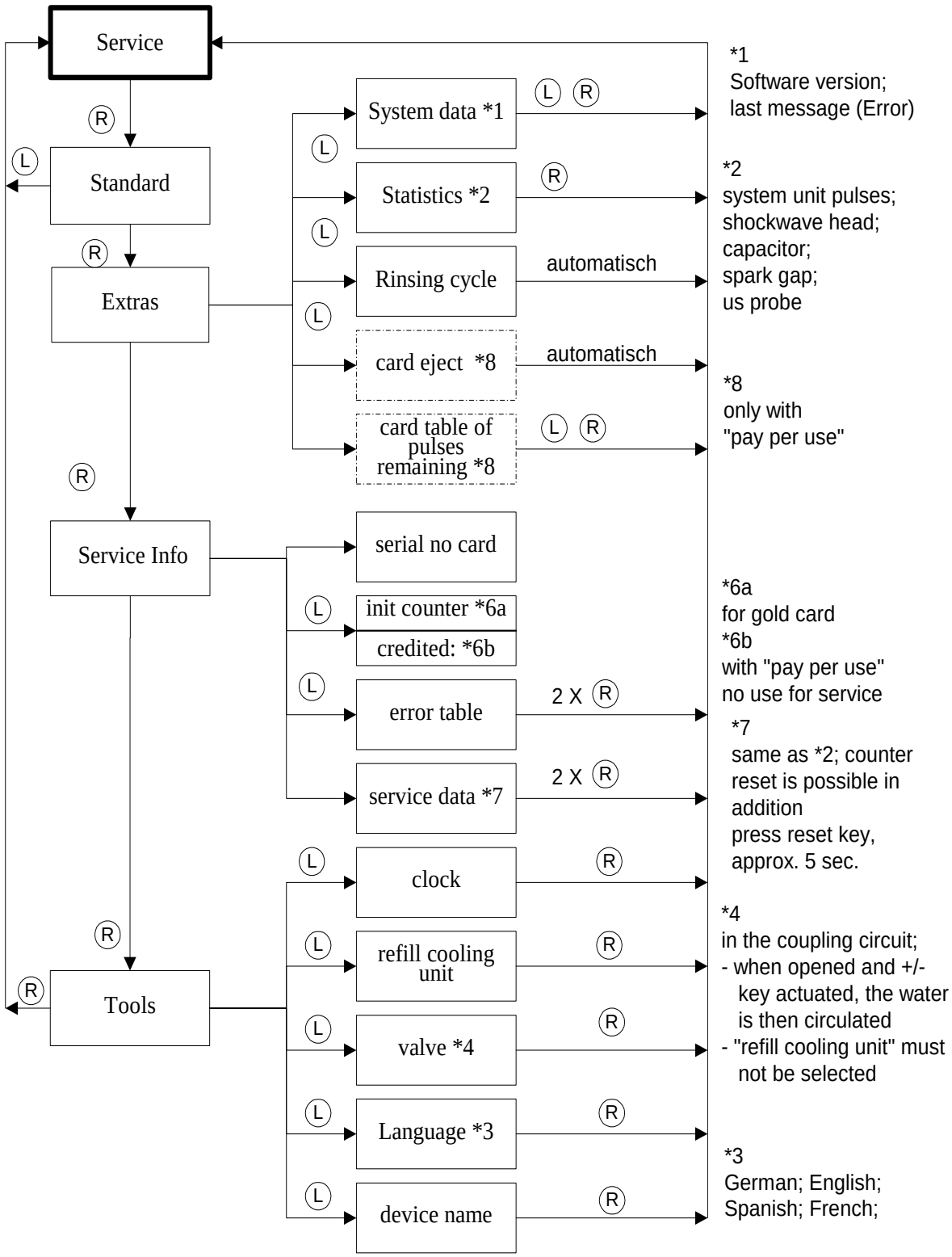
*2 System unit pulses; Shockwave head; capacitor; spark gap; us probe

*3 Only if "Pay per use" is present.

Service

If the service switch on M13/D3/S2 is set to position 2 (Service on),

the following functions will be activated in addition to the normal user functions.
The “SERVICE” notice will be displayed in the main menu.



Setting the system clock

- Press the upper right selection key in the main menu until the "TOOLS" menu appears.
- Select the “SET CLOCK” menu item.
- Set the current date and time with the keys.
- Exit the "TOOLS” menu with “set”.

NOTE	**When changing the battery, use original spare parts only.**

System messages for the user and for service

General information regarding the system messages

User

Malfunction (Prio 1):	A malfunction has occurred in the system. The system message can be deleted by briefly pressing the RESET key (in the main menu only). If the malfunction affects a function not currently being used, the user can continue working without restrictions. If the malfunction has affected the charging process, the current charging process and the series will be interrupted. After actuating the sound wave pulse trigger again, additional pulses can be released.

User

Error (Prio 2):	An error has occurred in the system which will cause basic function restrictions. The system error message can be deleted by briefly pressing the RESET key (in the main menu only).

User

Notice:	Temporary disturbance that will correct itself or can be corrected by the user.

User

Notice	Cause
Please wait!	Sound wave energy too high. Charging - please wait (wait time < 1 min).
Stopped!	Sound wave pulse setting reached! Reset the current sound wave count (the energy level will be reset to1) or Increase the counter setting.

Temperature

There are various causes for this error, depending on the preceding error:

Errors 31 and 34:
If the error cannot be cleared by resetting the system (switching off/on), please notify customer service.

Error 32:
Temperature in the sound wave source too high.
When the unit cools down, the message will disappear and sound wave pulses can be triggered once again.

Error 33:
Temperature in the sound wave source too low.
After the unit warms up (> 5 °C), the message will disappear and sound wave pulses can be triggered once again.

If the message does not disappear even though the system has cooled down or warmed up, notify customer service.

Service

Internal caution (Prio 3):

These error functions are not visible to the user.
This message is not visible on the display. It is shown for service personnel on the error list only.

Malfunction / Error messages

No.	Prio	Error text (English)	Description	Service information
10	2	pressure low (cooling circuit)	The cooling circuit has exceeded the minimum pressure. The pressure switch has responded.	Increase the pressure in the cooling circuit.
11	2	pressure high	The cooling circuit has exceeded the maximum pressure. The pressure switch has responded.	
13	1	motor failure (cooling circuit)	A short circuit occurred in the motor for the cooling circuit pump.	Replace components M13, the cable connection to the cooling circuit motor or the cooling circuit motor.
14	1	water level low	Water level in the water storage tank too low.	Refill the coupling circuit. Repair any leaks.

No.	Prio	Error text (English)	Description	Service information
17	1	motor failure (coupling circuit)	A short circuit occurred in the motor for the coupling circuit pump.	Replace components M13, the cable connection to the coupling circuit motor or the coupling circuit motor.
18	1	failure (water circulation cycle)	The water circulation cycle was not successfully completed; cycle is terminated.	Refer to additional error messages (in connection with this error).
21	1	pulse count failure	The pulse counter in RAM does not match the value calculated in the system counter.	Check the display. Replace it, if necessary. Software error.
22	1	key pressed (display)	When the system was started up a switch was activated on the operating panel. (condition still exists).	Replace the operating panel.
23	1	key pressed (handle)	When the system was started up a switch was activated on the control handle. (condition still exists).	Replace the control handle.
24	1	key pressed (trigger)	When the system was started up, the pulse release switch was activated. (condition still exists).	Replace the control handle or the pulse release switch.
25	1	pulse count failure (display)	The pulse counter on the display does not match the system pulse counter. An error occurred when writing to the display.	Replace the control panel.
31	1	temperature sensor failure (all)	Two or three of the temperature sensors in the sound wave source are defective.	Replace the sound wave source. Check the temperature sensor connections.
32	1	temperature too high (cooling unit)	The temperature of the sound wave source has exceeded the maximum value.	Check the function of the cooling unit. Cooling circuit pump ?

No.	Prio	Error text (English)	Description	Service information
33	1	temperature too low (cooling unit)	The temperature of the sound wave source has exceeded the minimum value.	Check the temperature sensor connections. Replace the sound wave source. Replace component M13. Check the termperature sensor connections.
34	1	temperature control failure	The temperature could not be determined: When converting the analog values of the temperature sensors, the ADC could not be accessed The power supply for the temperature sensors is not within the acceptable range.	Refer also to error 45.
42	1	power supply failure (M1, 24 V)	Voltage for motor M1 too low.	Check the power supply for motor 1 (cooling circuit motor). Check fuse F2 on control board D3.
43	1	power supply failure (M2, 24 V)	Voltage for motor M2 too low.	Check the power supply for motor 2 (coupling circuit motor). Check fuse F3 on control board D3.
45	1	power supply failure (8 V)	8 V board supply voltage too low.	Check the power supply for the temperature monitor.
46	1	power supply failure (12 V)	12 V board supply voltage too low.	Check the 12V power supply.
47	1	power supply failure (Valve, 24 V)	Voltage too low for the coupling circuit valve.	Check the valve (coupling circuit). Check the voltage at the valve. Check fuse F4 on control board D3.

No.	Prio	Error text (English)	Description	Service information
48	1	watchdog RESET occurred	A Watchdog RESET was triggered.	Software error.
52	1	battery low	Battery back-up voltage too low for the RAM and the real time clock.	Replace the lithium battery on D3.
53	1	CMOS data invalid	Invalid data in the RAM battery back-up.	This normally occurs at the initial start-up and when replacing the lithium battery. Replace component M13 or the lithium battery.
59	1	unstable charge current	Charge current unstable (exceeds the max./min. tolerance threshold).	Replace the charging unit.
60	1	charge current too low	Charge current too low during charging process.	Check the line voltage. Replace the charging unit. Check fiber optic cable.
61	1	charge current too high	Charge current too high during charging process.	Check the line voltage. Replace the charging unit.
62	1	kV actual > kV max (capacitor)	Capacitor voltage higher than the maximum value.	Replace the charging unit.
63	1	capacitor defective	Capacitor defective in the charging unit (out of tolerance).	Check the high voltage cable connections and the capacitor connections. Replace the capacitor/ charging unit.
64	1	kV (intended) bad	The actual voltage in the voltage frequency converter is higher than the selected voltage (Unom)	Replace the charging unit. Check fiber optic cable.
65	1	kV actual <> kV selected (capacitor)	The actual voltage in the capacitor is higher than the selected voltage. (voltage value calculated from the energy level).	Replace the charging unit.

No.	Prio	Error text (English)	Description	Service information
67	1	no ignition (repeated)	No spark gap ignition after triggering. (repeated).	Replace the spark gap. Check fiber optic cable.
68	3	kV breakdown	kV breakdown in the capacitor.	Replace the charging unit.
69	1	self-ignition (repeated)	Self-ignition occurred repeatedly.	Replace the spark gap.
70	1	discharge too low	The discharge current was too low after ignition.	Check the high voltage cable connections. Replace the sound wave source.
71	1	discharge too high	The discharge current was too high after ignition.	Check the high voltage cable for shorts. Replace the sound wave source.
72	1	charge unit communication failure	Communication with the charging unit was not possible.	Check the line voltage at the charging unit. Replace the fuse for the charging unit. Check the fiber optic cable.
74	1	U (load) unstable	Unstable capacitor voltage (exceeds the max./min. tolerance threshold).	Replace the charging unit.
75	1	invalid energy level (RAM)	The energy level copied in RAM no longer matches the original energy leve.l	Replace control component M13.
76	1	kV(actual) <> energy level	The actual voltage in the capacitor is higher than the acceptable voltage (voltage values taken from a table--> Index from the energy level).	Replace control component M13.
77	1	energy level invalid (display)	Energy level display ¼ selected energy level, energy level display malfunction.	Replace the operating panel.

No.	Prio	Error text (English)	Description	Service information
78	1	charge time limit exceeded	The charging time exceeded the time limit.	Replace the charging unit.
85	1	flash type invalid	Invalid or defective FEPROM.	Replace the system memory (FEPROM.)
86	1	flash error	FEPROM defective.	Replace the system memory (FEPROM).
87	1	flash data invalid	FEPROM data invalid.	This normally occurs at initial system start-up or when replacing the system memory. Replace the system memory (FEPROM).
200	1	Card terminal failure	Error while accessing chip-card reader	Check chip-card reader module and cable
210	1	Card init limit exceeded	Max. number of gold card initializations exceeded	Change gold card
300	3	Internal error	Serial interface cannot be initialized.	

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Communication of D3 board - charging unit

Fiber optic cable (LWL)	LWL disconnected on charging unit Look at LWL	LWL disconnected on D3 board Look at LWL	Error situation (error message appears when release switch for shock waves is pressed)
U1 (D out) Data from A/D converter in charging unit to D3 board	Light visible	Light visible	Error 72
U2 (HV on) High voltage on	Light visible when release switch for shock waves is pressed	Light not visible	Error 60
U3 (HV set) Ref. voltage (energy level)	Light visible	Light not visible	Error 64
U4 (Trigger) Trigger pulse for spark gap	Light visible when release switch for shock waves is pressed	Light not visible	Error 67
U5 (Clk) Clock - Synchronization of A/D converter in charging unit and of D3 board	Light visible	Light not visible	Error 72
U6 (CS) Start of A/D converter in charging unit	Light visible	Light not visible	Error 72
U7 (D in) Data for A/D converter to charging unit from D3 board	Light visible	Light not visible	Error 72

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Chap. 0 - 4	Cover page, Revision level and table of contents updated.
Chap. 7 - 6	Error 68 - New Text inserted
Chap. 7 - 7	Table: Nr. 200 - New Text inserted
	Table: Nr. 210 - New Text inserted

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